TERRA Transportation Engineering and Road Research Alliance
Partnering for Roadway Innovation
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Low-Cost Engineering Infrastructure Safety Improvements

Photo courtesy of the Iowa Department of Transportation

Due to efforts at the federal, state, and local level, America's roads have become safer. However, nearly 34,000 motor vehicle fatalities still occur each year in this country. To support the continued work of the many individuals and organizations dedicated to reducing the number of fatal and severe injury crashes on U.S. roadways, the Federal Highway Administration has required safety plans for every state. The goal is crash prevention—to understand and implement safety improvements in the most appropriate locations before crashes occur. Reliance on accurate data, analysis, and measurement-driven approaches is crucial to successful implementation of these plans.

The Transportation Research Board NCHRP Series 500 guides were developed to assist state and local agencies in meeting these safety goals. The guides correspond to emphasis areas outlined in the American Association of State Highway and Transportation Officials (AASHTO) *Strategic Highway Safety Plan* (SHSP), which identifies the crash types that cause the most fatalities and serious injuries and therefore require the highest priority attention.

While the Federal Highway Administration and AASHTO urge DOTs to include all "4Es" of safety—engineering, education, enforcement, and emergency medical services—in their own SHSPs, this fact sheet describes some of the easy-to-implement, low-cost, and effective *engineering* safety improvements DOTs can integrate into their road building and restoration programs. Specifically, these strategies address two of the most deadly crash types: road/lane departures and intersection crashes.

Road/Lane Departure Crashes

The National Highway Traffic Safety Administration (NHTSA) reports that nationwide, nearly 4 of every 10 fatal motor vehicle crashes involve a single vehicle leaving the roadway, with more than twice as many lane departure fatal crashes on rural roads than on urban roads. Some 42 percent of lane departure fatal crashes occur on horizontal curves (50 percent in rural areas), but these curves account for only 5 to 10 percent of the road system by mileage.

- ***Strategy: Improve Road Edges***—Install edge-line rumble strips/stripes, safety edges, and enhanced edge markings.

- ***Strategy: Enhance Delineation of Horizontal Curves***—Prioritize the highest-risk horizontal curves based on these risk factors: curve radius, traffic volume, and the presence of visual traps and intersections. Install chevron warning signs and pave narrow shoulders with edge-line rumbles.

Photo courtesy of the Concrete Paving Association of Minnesota

Embedded pavement stripes

As with any other innovative safety solution, embedded stripes are still a work in-progress and, with time, contractors will try several different processes or mechanisms to make it as efficient and useful as possible. Embedded stripes are formed in the concrete—as opposed to grinding them in—by a few different processes ranging from adding a bent piece of plate steel on the texture cart to using dumbbell weights on a steel ski. So far, owners have been happy with the results and the technique is becoming more of a norm rather than exception as part of concrete pavement construction.

Intersection Crashes

In 2009, there were 33,808 fatalities on U.S. roadways. Of these, 7,043—20.8 percent—were intersection or intersection-related. Clearly, intersections represent a disproportionate share of the safety problem, partly because they present some of the most complex traffic situations drivers encounter. The dangers are compounded with the addition of speeding motorists who disregard traffic controls. The main issues in metropolitan areas are angle crashes at signalized intersections; on rural roads the issues are right-angle crashes at stop-controlled intersections.

- ***Strategy: Reduce Intentional Run-Light Running***—Install traffic signal confirmation lights: white or blue lights located directly above the traffic signal and lit simultaneously as the red signal indication to which it is attached. This allows police officers to see red-light runners from a distance and from any side of a signalized intersection.

- ***Strategy: Improve Visibility of the Unsignalized Intersection***—Install larger regulatory and warning signage (STOP/STOP AHEAD), provide a STOP bar (or provide a wider stop bar) on minor-road approaches, provide pavement markings with supplementary messages such as STOP AHEAD.

Photo courtesy of Minnesota LTAP

What TERRA Members are Doing

TERRA members are using many low-cost, effective strategies to prevent fatal and serious injury crashes. For example, the New York State Department of Transportation (NYSDOT) is using pedestrian countdown timers and raised crosswalks to implement intersection crash-reduction strategies. To reduce the number of road/lane departure crashes, NYSDOT uses safety edges on hot-mix pavement, rumble strips along pavement edges and centerlines, high-visibility signpost wraps, and cable median barriers (NYSDOT developed a nonproprietary, four-cable, low-tension median barrier).

The Minnesota Department of Transportation (MnDOT) uses confirmation lights, flashing yellow arrows, and optimized signal timing to reduce crashes at urban intersections. At rural thru-stop intersections, MnDOT uses the signing and marking package as seen in the *MnDOT Traffic Safety Fundamental Handbook* (page 57). To prevent road/lane departure crashes, MnDOT uses rumble strips and stripes, high-performance pavement markings, chevrons in curves, curve widening (high and low sides), and rumbles on the high side.

About TERRA

The Transportation Engineering and Road Research Alliance, or TERRA, brings together government, industry, and academia in a dynamic partnership to advance innovations in road engineering and construction, including issues related to cold climates. More about TERRA is online at www.TerraRoadAlliance.org.

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Key Resources

- FHWA Safety Program
- AASHTO Strategic Highway Safety Plan
- *Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, Volumes 1-20* (NCHRP Report 500)
- FHWA Signalized Intersection Safety Strategies
- *Driving Down Lane-Departure Crashes* (AASHTO, 2008)
- *Traffic Safety Fundamentals Handbook* (MnDOT, 2008)
- *Traffic Sign Maintenance/Management Handbook* (Minnesota LRRB, 2010)
- County Traffic Safety Plans (MnDOT State Aid)
- MnDOT County Road Safety Plans (Minnesota TZD, 2010)

Links to these resources are on the TERRA website at www.TerraRoadAlliance.org.

For More Information

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